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RECENT SOVIET ACTIVITIES IN THE ARCTIC AND ANTARCTIC

[Comment: Temperatures given are in degrees centigrade. Numbers in parentheses refer to appended sources. Figure showing Arctic ice drift is appended to text.]

Results of the Polar Expedition April 1954-April 1955

During its first year of drift (April 1954-April 1955), the drifting station Severnyy Polyus-4 covered a distance of 2,600 kilometers with a general northerly movement of little more than 520 kilometers. The average speed of drift totaled about 7 kilometers a day, including a northerly movement of about 1.5 kilometers a day. Maximum drift speed was observed in August of 1954 and amounted to 10.7 kilometers a day. During this same month, the straight-line drift was to the north-northeast at an average speed of 3.6 kilometers per day. The minimum daily average speed of drift was noted in February 1954 and amounted to 4.9 kilometers.

The drift was begun in the western hemisphere, and during the year the station crossed the 180th meridian four times. The station's drift measured from its most northwesterly point to its most northeasterly point spanned 15 degrees 47 minutes of longitude. Six parallels of latitude were crossed during the year (76-81 north).

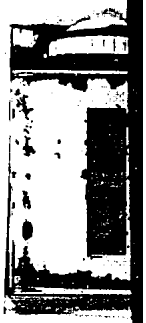
The general line of drift was in a circular, clockwise direction with a maximum arc angle of about 25 degrees (in August 1954) and a minimum angle of about one degree (in September and February).

The drift of Severnyy Polyus-4 verified once more that the movement of ice in the Central Polar Basin is determined by the speed and direction of the wind and is in a clockwise direction. This ice movement is not completely fixed, however, and under various conditions (usually anomalies in the synoptic processes) it is disrupted.

The weather during the year was cyclonic in character, moving into the camp's area from the south, the west, and the north (the Atlantic). The most intense cyclones were experienced in the summer and the beginning of winter. The lowest average monthly atmospheric pressures were observed in August (a little over 1,000 millibars), and the highest atmospheric pressures were observed in March 1955 (about 1,038 millibars). The warmest month was July, and the coldest was February, with a minimum temperature of 49 degrees below zero.

Almost the entire summer was overcast, and fog was common. In the winter, on the other hand, fog was rare. Wind direction differed sharply month to month, and average wind speed varied from 3 to 6 meters per second, with maximum wind speeds exceeding 20 meters per second.

The sharp wind changes in the area of the station produced a great deal of ice motion and pressure, and as a result the station's floe was split several times. By the beginning of freezing, its dimensions had been reduced to one tenth their original size. By April 1955, however, the floe had frozen to other floes to form a new large mass.



In the course of the year, Hydrologists Dem'yanov and Izvekov recorded more than 750 ocean depth measurements. This makes it possible to define more clearly the basic bottom relief in a large area of the eastern Central Polar Basin, particularly around the pole of relative inaccessibility. The presence of a narrow strait has been established which runs along the ocean bottom between the large depression (with depths of 4,000 meters) lying to the north and northeast of the Chukchi Sea and the small depressions of the Beaufort Sea.

An underwater peninsula of the continental slope was also discovered running from the Bering Strait northward to the 80th parallel. This peninsula is cut by canyons reaching depths of more than 1,200 meters. In the northern part of this submarine peninsula, there is an elevation rising to within 330 meters of the ocean's surface. To the west, there is a local, circular depression with depths up to 2,245 meters. In the area of the pole of relative inaccessability, there is an elevation of the bottom (to 1,320 meters) which is connected with the northern part of the underwater peninsula. Throughout the period of drift, ocean depths varied from 293 meters to 3,286 meters.

The hydrologists at Severnyy Polyus-4 took 23 bottom samples from various depths. Laboratory analysis of these samples will be of great interest in the study of the formation of the Central Polar Basin and the coasts lying around its perimeter.

The hydrologists also collected a large amount of material on deep-water fauna.(1) This material, as well as similar material gathered at Severnyy Polyus-3, has been sent to Leningrad for detailed scientific study in the Zoological Institute of the Academy of Sciences, USSR. About 150 plankton samples and several living forms taken from the ocean bottom are among this material.

The results of this research is of great scientific interest, because until recently there was an absence of precise information on the composition of fauna in the areas crossed by the drift stations.

Of particular interest are numerous new types of marine life taken from great ocean depths. These include Copepoda crayfish, some 3-4 millimeters in length (2), which were found in the 750-2,000-meters water layer.(1) The discovery of these Crustacea in the eastern part of the Artic Ocean verifies once more the complete division of the Arctic Ocean by the range imeni Lomonosov, for these Crustacea were not encountered in the western part of the ocean.

Within the plankton samples taken in the Central Polar Basin, a representative of a single group of worms was found for the first time. This is one more indication that fauna in the central part of the Arctic Ocean are significantly more diversified than was previously supposed(2)

For measuring ocean currents at Severnyy Polyus-4, self-recording indicators made by the Arctic Institute were used. Thanks to these instruments, tens of thousands of current measurements at various water levels were received. A great deal of material was also collected on temperature and chemical composition of ocean water.

The meteorologists at Severnyy Polyus-4 (under the direction of Ovchinnikov) carried out more than 2,800 scheduled meteorological observations during the year. These observations, in conjunction with the aerological observations, are being used not only for the practical work of the weather bureau in improving forecasting, but also for further studies on climate and weather

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in the Central Polar Basin. For a significant part of the year, intense cyclonic activity was noted in the drift area. The cyclones, and the fronts connected with them, were very well defined in terms of pressure, temperature, humidity, wind, and cloud formation.

The intense cyclonic activity indicates the partial carriage of warm air masses into the drift area of Severnyy Polyus-4. Even in the winter, this station encountered warm air masses which moved from the Atlantic, across the North Pole, to the pole of relative inaccessibility. During the course of the year, it was established that cooling in the station's area was connected with winds from the northeasterly quadrant, and warming was connected with winds from the southeasterly quadrant in summer and from the northwesterly and southeasterly quadrants in winter.

Observations of relative humidity changes in relation to air temperature were also carried out. In addition, regular temperature soundings of the atmosphere were made twice a day -- the first time such a program has been carried out by two drift stations over a period of a year. At Severnyy Polyus-4, aerologists Shchekin, Babarykin, and Silin launched about 800 radiosondes with an average observation height of over 18 kilometers. Material received from temperature soundings and material on winds permits the making of several accurate suppositions on general atmospheric circulation.

These observations also established a fluctuation in the height of the tropopause -- a fluctuation having a greater amplitude in winter than in summer. The maximum height of the tropopause was connected with the influx of warm air, and the minimum height was observed during anticyclonic activity of Arctic air.

For the first time on drifting ice, atmospheric soundings were carried out using captive balloons, airplanes, and helicopters. The personnel of the station developed a method for carrying a meteorgraph in the helicopter.(1)

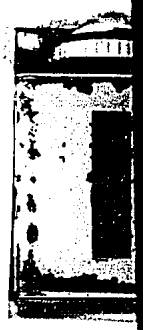
The basic aerological material gathered by the two stations is being processed by the Arctic Scientific Research Institute. The high quality of this material is assured, since the work was done by highly qualified specialists using equipment prepared by the Central Aerological Observatory for use in the Central Arctic.(2)

Actinometric observations carried out at the station Severnyy Polyus-4 have provided precise data on radiation in the Central Arctic and heat balance in the Arctic Ocean.

As a result of magnetic observations completed, an entire system of material has been gathered on temporary changes (variations) in the earth's magnetic field in the drift area. Data on elements of the geomagnetic pole will permit the composition of more precise magnetic maps and explain local magnetic anomalies which are very important in composing aerological maps of magnetic variation. The magnetologist at Severnyy Polyus-4, Belarov, determined the station's position 420 times during the year. This data is necessary in a number of fields, especially in the study of ice drift.

Important scientific work was also done by Dr Paleyev (at Severnyy Polyus-4), who collected material on changes in the human organism during a prolonged stay in the Central Arctic.

During the first year of the polar expedition, the helicopter was used in research work for the first time. Its use permitted the personnel of the stations to carry out temporary hydrological stations to the sides of the drift lines.



An auxiliary base to Severnyy Polyus-4 was established on one of the neighboring ice floes which was used for some time as a landing area for aircraft from the mainland. At the beginning of the drift this floe was located 3.5 kilometers from the main camp's floe, but during the summer this distance increased to 25 kilometers. A part of the station's personnel spent various periods of time (up to a month) on the auxiliary floe and carried out scientific observations there. Communications were maintained between the two floes by helicopter and occasionally by AN-2 aircraft. Thus, on those occasions when the helicopter was out with a scientific party at distances of up to 100 kilometers from the main camp, there were actually three observation points being manned simultaneously by personnel of Severnyy Polyus-4.(1)

The Drift Stations Since April 1955

The original staff of Severnyy Polyus-4 was relieved by new personnel on 17 April 1955 when the station was located at 80-53N and 175-50W.

Severnyy Polyus-5 was established on 20 April 1955 at 82-04N and 157-00E. [The station was actually set up over a period of 4 days. 18-22 April, but 20 April is its official date for commencing operations. This station replaces Severnyy Polyus-3 which was abandoned on 20 April.](3)

The subsequent movement of the two stations can be seen to some degree in the following sets of coordinates:

Severnyy Polyus-4

17 May -- 81-15N 177-11E (4)

24 June -- 81-36N 180-39E (5) [Soviet sources sometimes give coordinates through 360 degrees in either a westerly or easterly direction from the prime meridian.]

31 July -- 82-14N 172-23W (6)

7 August -- 82-26N 187-44E (7)

20 September -- 83-23N 175-55W (3)

Severnyy Polyus-5

21 May -- 83-01N 152-02E (8)

29 May -- 82-55N 152-32E (9)

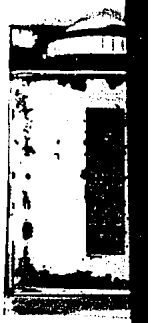
23 June -- 83-45N 150-21E (10)

31 July -- 84-08N 154-40E (6)

27 August -- 84-34N 150-49E (3)

20 September -- 84-50N 143-38E (3)

During its first month of operation after the arrival of a relief crew, the station Severnyy Polyus-4 drifted along an irregular course for a distance of about 200 kilometers. In April and early May, the weather at the station was clear, sunny, and calm, but toward the end of May a series of cyclones passed which resulted in cloudy weather with strong winds and poor visibility. The temperature ranged from 18 to 20 degrees below zero.



The scientific personnel of the station were fully occupied in the first month as the aerologist pursued radiosonde observation (with average ascents of 21,000 meters) and the hydrologists relocated their current recorders, bathometers, dredges, etc.

In addition to the regular station personnel, scientific work was done during the month by representatives of the Arctic Institute and the Electrotechnical Institute and by Savel'yev (Moscow State University) who arrived in May with new scientific instruments.

The station's radio operators continued the regular policy of sending weather observations to the mainland eight times a day.(4)

After 2 months of drift, Severnyy Polyus-4 had covered about 400 kilometers along an irregular course. The scientific program during this second month was distinguished by three projects carried out in addition to the regular schedule of observations.

Shil'nikov, using theodolite and range finder, made extensive studies on drift of neighboring ice with the aid of the helicopter. The object of these studies was to determine ice drift with respect to field dimension and form in addition to the influence exerted by wind and currents.

The aerology section carried out vertical soundings of the atmosphere from sea level to 1,500 meters. These observations will be used in studies on the influence of the surface atmosphere in weather formation.

Actinometrist Chernigovskiy began a program of solar energy measurements on the ocean's surface, within the ice, and below the ice.(11)

By 26 June, after 70 days of operation, Severnyy Polyus-4 had drifted a total of about 450 kilometers with a straight-line northerly movement of 135 kilometers. By the end of June, the station was drifting rapidly to the northeast. At this time, an aircraft piloted by Sorokin arrived from the mainland with reading material, films, and other cargo.(5)

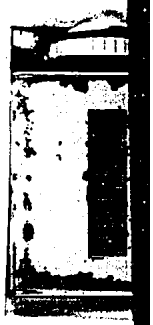
At the end of its 3d month of operation, Severnyy Polyus-4 began to drift more rapidly. From 10 June to 15 July, the station moved a straight-line distance of only 12 miles to the north, but in the last part of July it covered a straight-line distance of 35 miles to the northeast.

The increase in drift speed was the result of increased cyclonic activity which also brought exceedingly variable weather. Toward the end of July, the station experienced a snow storm, clear weather, rain, and high winds, one after the other in a short period of time.(6)

The weather became relatively warm, with rains at Severnyy Polyus-4 with the beginning of August. The station was visited at this time by Meleshko, the chief of the Tiksi Observatory.(7)

With the completion of 4 months of operation on the station, the new staff of Severnyy Polyus-4 found their camp very much changed in appearance. With the advent of the summer thaw, melt water formed lakes and streams on the surface of the camp's floe. This water was a very serious problem, since the weight of the winter's snow had lowered the surface of the ice floe in some places to below the ocean surface level, thus preventing normal runoff.

By the middle of August, temperatures at Severnyy Polyus-4 remained above 3 degrees below zero.(12)



After 5 months of drift in its second year of operation, this station had moved 280 kilometers to the north and was located 1,300 kilometers from Ostrov (island) Vrangelya and 750 kilometers from the North Pole.

The station's drift has been slower than during its first year due to the heavier ice concentrations to the north. In its first year, average daily drift was 7 kilometers while so far in its second year the average daily drift has been 6.3 kilometers.(3)

The scientific work of the station is being aided to a great extent by newly developed equipment. Current measurements are being made using self-recording instruments developed by N. Telyayev, engineer-oceanographer, and Yu. Alekseyev, member of the Arctic Institute. N. Telyayev also developed a deep-water sounding winch which permits the raising of bottom samples containing rocks and gravel in addition to the usual silt and sand.(30)

The 1955-1956 relief staff at Severnyy Polyus-4 includes the following personnel:

Chief -- P. A. Gordiyenko (13)

Hydrologists -- N. I. Telyayev, V. I. Shil'nikov, and M. M. Nikitin (14) [Soviet sources refer to these men as either hydrologists or oceanographers.]

Meteorologists -- Chernigovskiy (also station actinometrist) and Rozhkov (4)

Radiomen -- Zakharin, Smirnov, and K. I. Vil'pert (14)

Mechanics -- M. P. Kislitsin and Ts. I. Khorzhanovskiy (14)

Aerologists -- S. S. Gaygerov, P. A. Dunayev, and G. L. Dolganov (15)

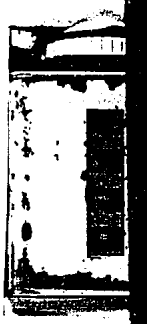
Helicopter pilot and crew -- N. S. Makarov (pilot), P. K. Pimenov, V. T. Yemel'yanov, A. F. Suvorov (14)

Doctor -- S. A. Syagayev (14)

Astronomer-magnetologist -- A. V. Teologov (14)

The new station, Severnyy Polyus-5, was set on the ice by the aircraft division commanded by Titlov. [Titlov was in command of the establishment of Severnyy Polyus-4 in April 1954.] The camp was set up on an oval ice floe with thicknesses averaging 3 meters (16) and rising to 8 meters in some places.(8) The heavy aircraft were landed on an ice floe 5 kilometers south of the camp, and equipment and personnel were transferred from there by helicopter.(16)

A good deal of new equipment was developed for use at Severnyy Polyus-5 using experience gained at the earlier drift stations. [At the same time, however, it should be borne in mind that considerable quantities of equipment, including huts, were transferred to this new station from Severnyy Polyus-3 when it was abandoned on 20 April 1955.] New houses, among other things, were sent to the station. These houses, built by the Sovetskiy Plant in Leningrad, are larger and warmer than those used at the other stations. They are heated electrically -- the first time such heating has been used under these conditions.



The entire camp will be electrified by an electric power plant, employed for the first time on drifting ice.(17) The generators for this plant, as well as electric motors used at the station, were produced by the Leningrad Elektrosila Plant.(18)

New scientific equipment has lightened the work program at Severnyy Polyus-5, even though this program is somewhat broader than at the other stations. In the field of hydrology, for example, a Soviet designed, highly sensitive vane is in use for measuring currents at all ocean depths, and a new electric thermometer is being employed for temperature measurements at varying thicknesses of ice cover. The entire camp area is connected by an automatic telephone exchange. (19)

By 22 May, after a month of drift, Severnyy Polyus-5 had covered a total of 220 kilometers, 140 kilometers in a general northwesterly direction. Drift speed during this time was quite high, reaching 13 kilometers per day on several occasions. This drift brought the station to the eastern slope of the Lomonosov Range and ocean depths decreased from 2,840 meters to 2,560 meters.(8)

From 22 May to 1 June the station moved to the east before the wind, and after 1 June it swung to the north. Air temperature during this period ranged from 2 to 10 degrees below zero, and the station was subjected to frequent snow storms and purgas.(20)

Throughout the first month, construction of housing and work areas continued at the station, with six houses completed by the end of May. Scientific work was carried out on a broad program during this initial period.(8) The aerology section completed 36 radiosonde launchings with a maximum ascent altitude of about 30 kilometers. The hydrology section submerged self-recording instruments at various depths to record direction and speed of currents on a sustained basis. The information from several of these instruments (which are bifilar) is recorded regularly by special machines located in a tent on the floe. This new equipment was made in the experimental shops of the Arctic Institute and is in use for the first time on drifting ice.(20)

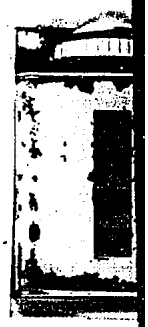
On 18 June, tremendous pressure was exerted on the camp area by surrounding ice, and a piece of the station's floe was broken off. The hydrological tent was located on the detached piece, but through the efforts of the entire staff all equipment was saved and moved to a new location.(21)

By mid-July, after 3 months of drift, Severnyy Polyus-5 had covered an irregular course of more than 550 kilometers. On 16 July, the ocean depth decreased during the 24-hour period from 2,780 meters to 1,500 meters as the station passed over the range imeni Lomonosov.

In the final days of July, the station's floe was constantly subjected to pressure from surrounding ice masses. This constant pressure reduced the size of the floe to 1/40 of its original size (5 square kilometers).(6)

After 3 1/2 months' drift, the station had moved in a general northwesterly direction 250 kilometers.(12)

By 20 September, Severnyy Polyus-5 was located 350 kilometers to the northwest of its starting point. The straight-line distance covered by this station was considerably higher than that covered by Severnyy Polyus-4 during the same period.



Information gathered at Severnyy Polyus-5 is of particular interest to scientists working on Arctic Ocean bottom relief. The station was organized on the eastern side of the range imeni Lomonosov, where ocean depths ranged from 2,700 to 2,800 meters. By mid-July, these depths began to fluctuate sharply, with daily changes reaching 1,000 meters on occasion.

On 27 August, when the station was located at 84-34N and 150-49E, ocean depth was 1,191 meters. Just 24 hours later the depth had increased to 1,560 meters. Until 14 September, the ocean depth fluctuated between 1,500 meters and 1,750 meters. In the course of just 11 hours on 15 September, the depth increased 1,000 meters. This drop indicated that the summit of the range imeni Lomonosov had been crossed and its western slope reached. As the drift continued to the northwest, a bottom depression was found with depths up to 5,000 meters.(3)

Soundings made at Severnyy Polyus-5 have also indicated the presence of a spur running off the eastern side of the range imeni Lomonosov. This spur appears to have heights over 1,000 meters and a length of several hundred kilometers.(30)

By mid-September, winter was arriving at Severnyy Polyus-5 as temperatures dropped to 10-20 below zero and water areas began to disappear beneath young ice.(3)

The staff of Severnyy Polyus-5 includes the following personnel:

Chief -- N. A. Volkov (19)

Hydrologists -- Z. Gudkovich (section chief), V. Spichkin (19), and N. Shesterikov (12)

Meteorologists -- G. Kizino (19)

Aerologists -- S. I. Sokolov (section chief), Didenko, and Nikovov (8)

Helicopter pilot -- I. Rozhkov (14)

Radiomen -- I. G. Galkin (chief) and M. Lyubarets (8)

Geophysicists -- R. Galkin and Aleksey Selivanov (19)

Doctor -- L. Ponomarev (22)

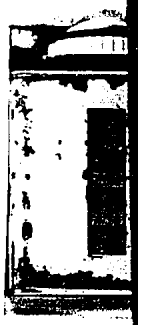
Mechanic -- I. P. Kirilyuk (19)

Cook -- V. A. Zagorskiy (19)

(Illustrations of the drift stations include: Aircraft arrives at Severnyy Polyus-4 with cargo [Photo No 152826]; the interior of the hydrologic tent, Severnyy Polyus-5 [Photo No 152827]; unloading an aircraft at Severnyy Polyus-5 [Photo No 152828])

Contributions of Aerial Expeditions in Arctic Research

The drift of ice, weather formation, and the development of ice masses on the Northern Sea Route depend to a considerable extent on hydrologic and meteorologic processes in the Arctic Ocean. A glance at a map of the Arctic shows that the Arctic seas, especially such seas as the Laptev, East Siberian, and Chukchi, have no northern boundaries but are connected directly to the Arctic Ocean by broad straits. Accordingly, conditions in the Arctic Ocean are reflected in the ice cover and atmosphere of the seas surrounding the Arctic Ocean. For this reason, science is according particular attention to research in the high-latitude areas of the Arctic.



Only with the expansion of aviation has it been possible to carry out a program of study on ice movements across the Northern Sea Route and in the Central Arctic through the use of survey flights and drifting stations which are established and supplied by aircraft.

The first scientific drift station, organized in 1937, gave a great deal of important material on weather in the Central Arctic and on ice drift. Since that time, regular flights have been carried out in high northern latitudes. In 1946, on the initiative of Prof N. Zubov and under his direction, an Arctic expedition was organized in an aircraft piloted by A. Bakhtinov. For 124 hours, the seas crossed by the Northern Sea Route and the high-latitude areas of the Arctic Ocean were surveyed. A great deal of important information was gathered on this flight which made possible ship operations during severe conditions of 1946. By the present day it may be stated that aircraft conduct ships across the Northern Sea route as much as do icebreakers.

In 1948-1950, high-latitude air expeditions were organized which carried out work in several dozen previously unstudied points in the Arctic Ocean. In these expeditions and on the drifting station Severnyy Polyus-2 (which was organized in 1950 under the direction of M. M. Somov), scientific research was carried out on a broad program including oceanography, meteorology, aerology, physics of ice and atmosphere, actinometry, hydrobiology, magnetology, and others.

These expeditions, coupled with additional aerial expeditions between 1951-1954 and the two drifting stations established in the Central Arctic in the spring of 1954, have provided new data which indicates that in the Arctic Ocean there are two basic systems of drift and surface currents. These are: (a) a drift on the arc of a great circle in the area situated to the west side of the submarine range imeni Lomonosov and (b) an anticyclonic, closed circular system in the water to the east side of the submarine range.

These schemes are verified by the drift of the scientific stations and the ice islands discovered by Soviet fliers in 1946. It should be noted that this theory was put forth for the first time by the Russian Arctic expedition of 1903.

Sometimes, during particular atmospheric conditions, the ice circulation in the western and eastern systems may mix and cross into one another.

Observations by expeditions and theoretical suggestions have verified the origin of the so-called ice islands drifting in the Central Polar Basin. It is most probable that these islands are made up of blocks of old fast ice, several decades or even hundreds of years old, formed somewhere in the shallow areas extending to the north of the Canadian Arctic Archipelago.(23) [Chart of ice drift as shown in Morskoy Flot, No 3, March 1955, p 27 is appended.]

Free Vessel Penetration to the North

The Soviet icebreaker F. Litke, one of the oldest and best known ships of the Soviet ice-breaking fleet, is presently sailing in the Arctic Ocean. On board the ship is a high latitude oceanographic expedition of the Arctic Scientific Research Institute under the direction of the well-known Soviet polar worker L. L. Balakshin. The scientific workers are carrying on a variety of investigations in the far northern latitudes, but the chief task of the expedition is to study the exchange of water between the Atlantic and the Arctic Oceans.

During its research voyage, the icebreaker F. Litke sailed from the Kara Sea and rounded Zemlya Frantsa-Iosifa to the north. A voyage along this route was completed for the first time in 1932 by Soviet polar workers in the small expeditionary ship N. Knipovich. This scientific expedition, commanded by Prof N. N. Zubov, did not penetrate as far north however as the F. Litke has done on this voyage.

On the night of 12-13 September the Litke, under the command of Capt V. I. Potashnikov, reached 83-11N and 49-03E. This is the most northerly point ever reached by a Soviet ship in free voyage. Until now the record penetration to the north had been held by the icebreakers Georgiy Sedov, Malygin, Sadko, Yermak, and I. Stalin.

In 1929, while working with an expedition from the Arctic Scientific Research Institute, the S S Georgiy Sedov sailed north from Ostrov Rudol'f under the command of Capt V. I. Voronin had reached 82-14N. In connection with the international polar year of 1932 the icebreaker S S Malygin under the command of Capt D. T. Chertkov completed two voyages to Zemlya Frantsa-Iosifa. On its second voyage the ship reached 82-28N. Twenty years ago, on 12 September 1935, the icebreaker S S Sadko took part in the first marine high latitude expedition of Glavsevmorput'. On this voyage, Sadko reached Mys Molotov, the most northerly point of Severnaya Zemlya. The directors of the expedition, G. A. Ushakov and N. N. Zubov, and the captain of the ship, N. M. Nikolayev, decided at this point to cross the continental slope and proceed to greater depths of the Arctic Ocean. At the edge of the close pack (82-42N and 37-04E) a depth of 2,365 meters was found. A complete oceanographic station was taken at this point. This was not only a record for free navigation by ship, but it was also the first case of a Soviet expedition proceeding to the deep water area of the Arctic Ocean.

In 1938, the icebreaker Yermak, under the command of Captain M. Ya. Sorokin, also established a record for navigation by a ship in ice. This ship's log carries the following coordinates: 83-05N and 138-22E. At this point, the Yermak was located only 415 miles from the North Pole.

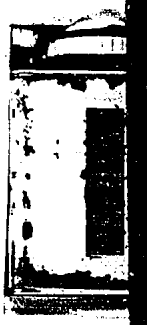
This same year, the new icebreaker I. Stalin completed its first voyage under the command of V. I. Voronin, following the drift of the icebreaker Georgiy Sedov, and reached 83-06N.

These records established by previous voyages have stood for many years, but now the F. Litke has proceeded further yet to the north and written a new page in the history of Arctic research.(24)

Arctic Industrial and Agricultural Activities

The ship repair plant and workers settlement at Zhatay, lying on the Lena River above the 62nd parallel, is growing rapidly year after year. Several new shops have been built at the repair plant, including a machine shop housed in a stone building. In addition to industrial buildings, the river workers at Zhatay have a dispensary, three two-story residential buildings, three dormitories, and many other buildings. In 1955, a nursery and five more dormitories are being built.

More than a hundred workers from the plant and the Torgsevmorput' sovkhoz attend the Zhatay school for working youth in the evening.(25) [Torgsevmorput' is identified as the Trade Administration of Glavsevmorput' in the Sobraniye Postanovleniy i Rasporyazheniy Pravitel'stva SSSR, (Collected Decrees and Regulations of the Government of the USSR) No 30, 8 July 1938, Division 1. It has not been identified in any later publication, however, including the decree of 25 January 1941 published by Sovnarkom SSSR and dealing with the organization of Glavsevmorput'. The Soviet Atlas Mira (Atlas of the World) shows Zhatay lying about 20 kilometers north of Yakutsk.]



In 1954, the Yartsevo Base of the Institute of Polar Farming, Animal Husbandry, and Related Procurement Enterprises completed tests on corn growth along the northern Yenisey River. Planting the corn in a superphosphate-loam mixture, the yield was as high as 400 centners per hectare.(26)

Soviet Arctic Personnel

Current assignments and activities of the following personnel have been mentioned in Soviet newspapers and periodicals:

M. Morov -- chief, Ostrov Vrangelya polar station (27)

I. Timovskiy -- chief, Bukhta Tikhaya polar station (27)

A. Bogomolov -- chief, Ostrov Uyedineniya polar station (27)

V. Rogachev -- chief, Mys Shmidta radio-meteorological station (27)

A. D. Kurochkin -- chief, Zemlya Frantsa-Iosifa vessel wintering station (28)

On 9 August 1955, E. T. Krenkel' presented a lecture and motion picture entitled "Soviet Drifting Stations in the Arctic." The lecture was given in the Officers' Club "Baltflot." (29)

[In connection with Soviet attempts to develop the Arctic areas, Prof G. I. Pokrovskiy has published an article (Moscow, Znaniye-sila, No 8, Aug 55) on his conception of an atomic powered icebreaker and an atomic powered submarine for operation below Arctic ice cover. Extracts from this article were later reproduced in Vodnyy Transport.]

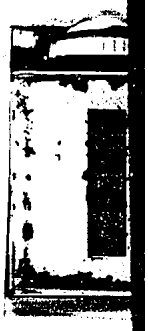
Soviet Research in the Antarctic

The Soviet Union is now preparing to dispatch a complex scientific expedition to the Antarctic under the direction of M. M. Somov. [Somov was chief of the drift station Severnyy Polyus-2 in 1950-51 and is now deputy chief of the Arctic Scientific Research Institute in Leningrad.] This expedition will do preliminary work and establish a scientific base camp for work next year in connection with the Third International Geophysical Year.

The expedition personnel will sail for the Antarctic in November aboard the 12,600 ton Ob'. [The Ob' is a diesel-electric ship built especially for ice navigation. She was built in Holland for the Soviet Union (along with two sister ships) and normally operates on the Northern Sea Route with the Murmansk Arctic Steamship Company.]

In 1955-56, the expedition will set up the main base on the Knox Coast and will explore the continental area for two advanced camp sites. A second scientific station will be located in the area of the geomagnetic pole and a third in the central circumpolar area or the region of the Antarctic pole of relative inaccessibility.

Research will be conducted simultaneously at the three continental stations and a broad program of oceanographic and geophysical observations will be carried out on the ship. The expedition will work on all problems encompassed in the program of the International Geophysical Year. The meteorologists will give special attention to the influence of the Antarctic snow cover on general atmospheric circulation with the aim of developing methods for long-range forecasts. The general program will also include work on the physical geography of the Antarctic and its glaciers, the geological characteristics of the Antarctic and its history, and the biogeographical characteristics of the high southern latitudes.(31)



In order to provide the facilities necessary for this work, the Ob' is now being outfitted as a floating scientific base at the Riga Shipbuilding and Ship Repair Plant of the Ministry of Maritime Fleet. The ship is being equipped with seven complete laboratories including one for each of the following: geology, chemistry, microbiology, and meteorology.

Deep-water winches and radio navigation aids of the latest design will also be installed. Cutters, kungas, and helicopters will be loaded for use by the scientific group on the Antarctic continent. Additional quarters are being prepared for scientific workers.(32)

In addition to two ships, the expedition will have a special aerial section composed of several transport aircraft and helicopters. Tractors, trucks, and dogs will be carried on the ships.

The program of the expedition will be pursued by many institutes of the Academy of Sciences, USSR, the Arctic Scientific Research Institute (Glavsevmorput'), the Institute of Terrestial Magnetism, the Central Geophysical Institute (Main Administration of the Hydro-Meteorological Service, Council of Ministers USSR), and other great scientific groups.(31)

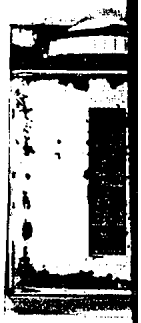
[In connection with this impending expedition, Soviet press and periodical sources have published several general articles on the Antarctic including the following: (a) an article on the general historical geography of the Knox Coast by Ye. Suzyumov, deputy chief of the Division of Marine Expeditionary Work, Academy of Sciences USSR (published in Vodnyy Transport, 3 September 1955); and (b) a general historical summary of Antarctic exploration (published in Vodnyy Transport, 13 September 1955).]

Previous to this major expedition, Soviet research in the Antarctic has been carried out by a scientific group from the All-Union Scientific Research Institute of Marine Fish Economy and Oceanography (VNIRO) which accompanies the whaling flotilla Slava on its Antarctic voyages. This group is directed by V. A. Zemskiy and includes hydrologists, hydrometeorologists, biologists, and technicians. The material gathered by the hydrometeorologists is utilized by the State Oceanography Institute (GOIN).

Before each whaling voyage, VNIRO composes a program of scientific work which is divided into three basic categories: biology, oceanography, and technology of whale processing.

Biological research is aimed at the collection of material characterizing the whale and the conditions which surround these creatures. Changes in the whale's appearance, dimensions, herds, etc., are reported. (Article contains a general discussion of whale research done by the biological workers including data collected on the age of sexual maturity in whales, special studies on finback whales, whale parasites, etc.)

The hydrometeorological and oceanographic part of the program includes hydrologic stations, hydrogeologic stations, and hydrobiologic stations. Six times a day, precise hydrometeorological observations are made to record changes in wind direction and velocity, wave structure, cloud formation, and other meteorological elements. Throughout the voyage, the scientific team studies form, dimension, and distribution of icebergs and sea ice, with special observations on the formation of icebergs and the distribution of their fragments in relation to the wind and current. The group also carries out research on the mechanical action of sea ice and icebergs, chemical analysis of sea water, and analysis of characteristic fauna and flora.



The scientific research program carried out on the ship is most directly connected with the whaling task set before the flotilla; therefore, the basic work is carried out in the area where the whales are hunted and along the route of the whaling fleet. The scientific ship does, however, make exploratory voyages for studying ice distribution, icebergs, and whales, and during these voyages hydrogeologic and hydrobiologic stations are taken. Interesting stations have been taken on the shores of Bouvet Island, an area studied very little in the past. From the south and west sides of the island, bottom samples of black sand and small pebbles were obtained, while on the north side of the island a large part of the bottom appears to be rock. It is interesting to note that black sand and pebbles of a similar kind were included in the green silt found by the scientific group at the South Orkney Islands, although it was not the basic bottom material.

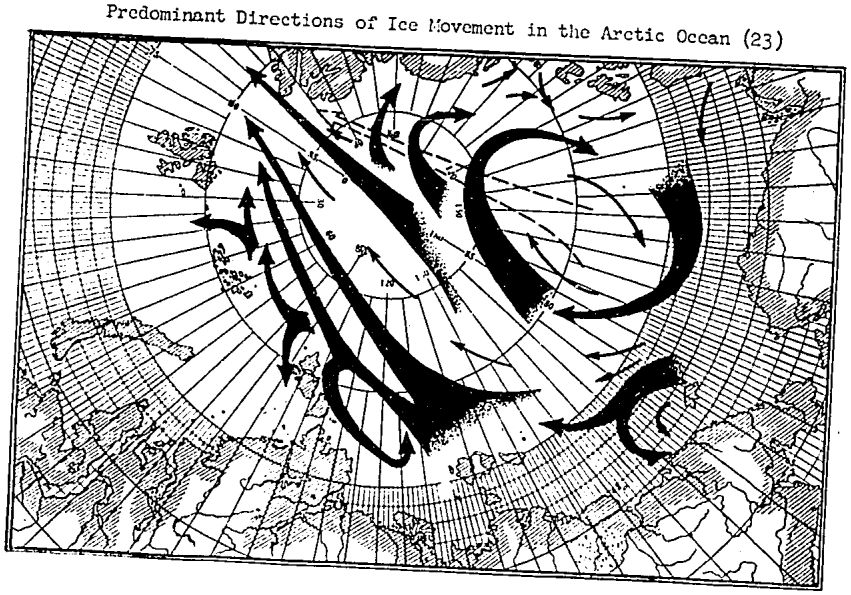
In the 1954-55 season, the scientific workers carried out interesting observations on the formation of icebergs in the Scott Sea. A vast tabular ice field stretches for a distance of several miles in that area with a relatively low surface (averaging 10-20 meters). This field is laced with vertical thermal cracks, the character of which indicates that they are formed as a result of heat expansion in the upper ice layers. The field is divided by these cracks into uniform pieces something less than 100 meters in length. During thermal expansion, young tabular icebergs slowly break away leaving narrow water leads. Later accumulations of these bergs, sometimes involving several hundred units, form large tabular icebergs.

The research program also includes studies on temperature and salinity of water in the vicinity of icebergs. For this work, very complex studies on microcirculation of water are made. In these studies, the scientific group found not only a horizontal mixing of water, but also a vertical mixing which results in a temperature and salinity increase in the upper layers of the ocean at many points. Another characteristic peculiarity of water in the vicinity of icebergs was found at a depth of 50-100 meters behind the iceberg. Here a sharp temperature drop was noted, a vestige of the cooling effect on the water from the passage of the iceberg. In 1954-55 this temperature differential between the surface and the 100 meter level was more than 2 degrees.

A compilation of several years' observations on the distribution of iceberg fragments in relation to wind direction indicates that in the majority of cases (almost 90 percent) fragments move out with the wind from the icebergs with a small deviation to the left of wind direction. During periods of calm, however, or shortly after changes in wind direction, fragments may be observed moving from the iceberg in opposition to wind direction. In these cases, the fragments appear to press against the iceberg, whereas fragments which move off with the wind frequently carry a good distance from the calving berg, sometimes completely out of sight. When a ship is navigating during a period of poor visibility, it is not always possible to pick up these small fragments with the aid of electronavigation instruments; therefore, observations on the distribution of iceberg fragments have a very great practical significance. (Article discusses work of the scientific group in the field of whale processing.) (33)

[Appended figure follows:]

Predominant Directions of Ice Movement in the Arctic Ocean (23)



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